

8/20/97

CVPIA COMPREHENSIVE ASSESSMENT AND MONITORING PROGRAM (CAMP)

Introduction

The Central Valley Project Improvement Act (CVPIA) was enacted in October 1992. Section 3406(b) of the CVPIA directs the U.S. Fish and Wildlife Service (USFWS) to develop and implement a series of restoration programs and actions for fish and wildlife purposes. The Act specifies that these actions should ensure that by 2002 the natural production of anadromous fish in Central Valley streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during 1967-1991.

The Anadromous Fish Restoration Program (AFRP) was initiated in response to Section 3406(b)(1) of the CVPIA. AFRP established baseline production numbers on Central Valley rivers and streams for chinook salmon (all races), steelhead trout, striped bass, American shad, white sturgeon, and green sturgeon. These numbers were based upon monitoring information collected from 1967-1991. AFRP established fish production targets based upon the baseline fish production numbers. The fish production targets represent a doubling of the baseline (1967-1991) fish production numbers.

CVPIA Restoration Actions

Sections 3406(b)(1) through (b)(21) [exclusive of (b)(16)] of the CVPIA provided the means to meet the anadromous fish production targets. These sections of the Act specify a series of restoration actions that will be implemented over time throughout the Central Valley. All of the actions can be classified as either water management, structural modifications, habitat restoration or screening type actions. Figure 1 illustrates the types of actions that are currently planned for implementation.

Comprehensive Assessment and Monitoring Program

Section 3406(b)(16) of the Act specifies the development of a monitoring and assessment program that will evaluate the overall effectiveness of the implemented CVPIA actions. The "Comprehensive Assessment and Monitoring Program (CAMP)" has been developed for this purpose.

Cathy, Alice, Karl

CAMP is focused on meeting two distinct goals:

Goal 1- assess the overall (cumulative) effectiveness of actions implemented pursuant to CVPIA Section 3406(b) by monitoring biological results and

Goal 2- assess the relative effectiveness of categories of 3406(b) actions toward meeting Section 3406(b) biological goals.

CAMP is designed to be broad in scope and evaluate the general or systemwide results of CVPIA actions rather than the performance of specific actions.

The CAMP Conceptual Plan was released for public review and comment in 1995. The CAMP Implementation Plan built on and refined the information in the Conceptual Plan. This Plan is the final phase in the CAMP planning process before implementation in 1997 (See Figure 2).

CAMP Recommended Monitoring Programs

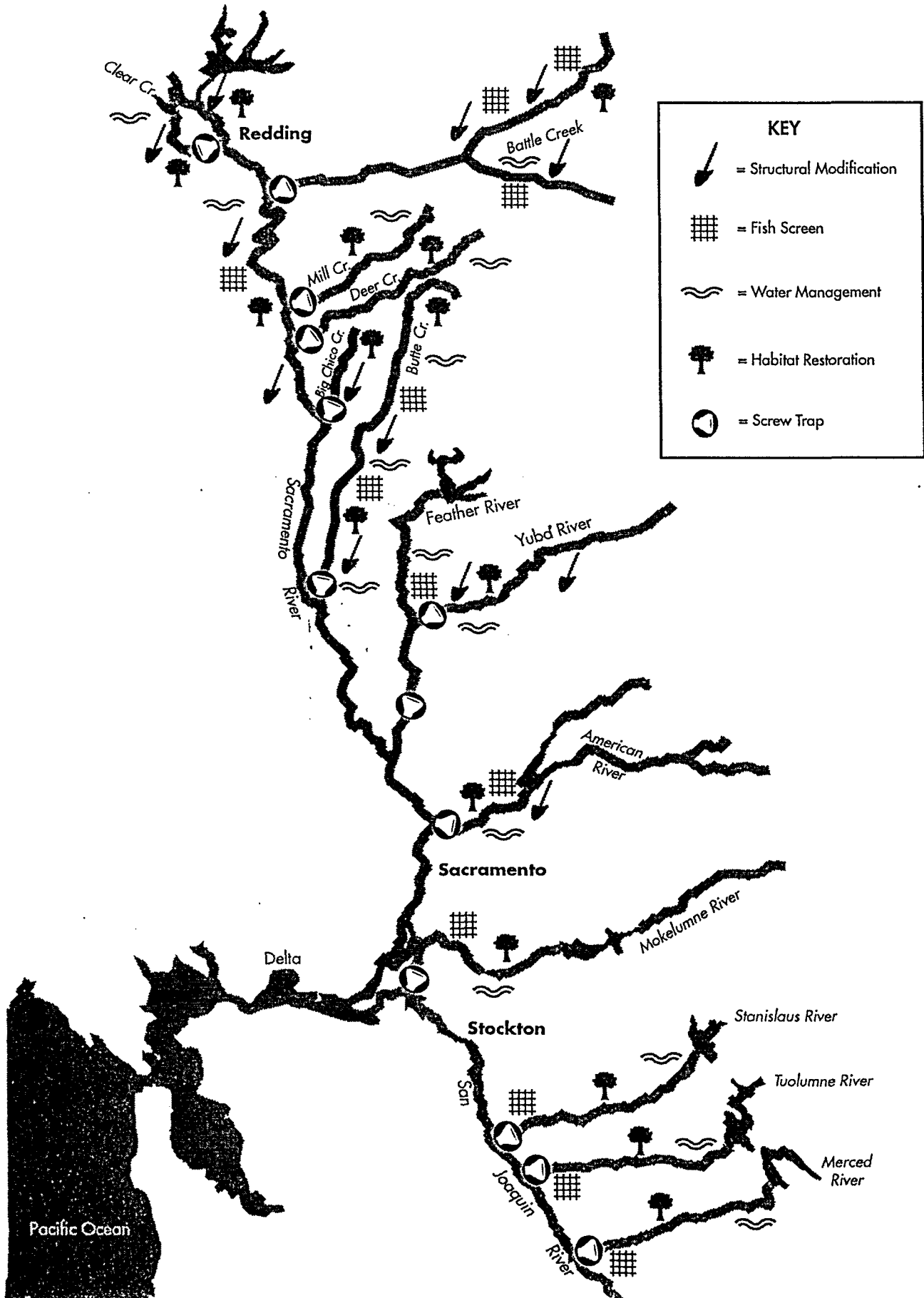
Progress toward meeting CAMP Goal 1 will be based upon measurement of increases in adult production of chinook salmon (all races), steelhead trout, striped bass, American shad, white sturgeon and green sturgeon. The CAMP Implementation Plan recommends a series of adult fish monitoring programs that will be used to calculate annual production estimates for each target species. Fish population trends will be developed by using the annual production numbers and comparing them to the 1967-1991 baseline production numbers. Because several generations of fish must be studied to get an accurate picture of their overall population status the monitoring program for Goal 1 will need to be long-term (25-50 years) and consistent. CAMP recommended adult monitoring programs are shown in Figure 3.

Evaluating the effectiveness of actions (Goal 2) in restoring anadromous fish populations is important for several reasons. Controversy currently surrounds the allocations of an increasing portion of California's water resources from current uses (such as agricultural, urban, municipal, industrial, and power generation uses) to anadromous fisheries needs. The use of flows to restore fish production is intensely debated among various water users and fisheries scientists because the relationship between flows and status of fish populations is not always clearly understood or documented. Additionally, the costs to agricultural and urban water users associated with increased flows are considered to be significantly greater than the costs associated with structural modification or fish screens. The role of water management modifications in achieving increases in fish production needs to be understood and documented to the degree possible. CAMP recommends that juvenile chinook salmon be monitored to determine what types of actions are working best to increase production. Juveniles chinook salmon were chosen because:

- they will only be exposed to the categories of actions occurring in their natal streams,

FIGURE 1

Juvenile Chinook Salmon Monitoring Recommendations and Categories of CVPIA Restoration Actions



D - 0 4 9 4 8 9

Figure 2. Comprehensive Assessment and Monitoring Program Development

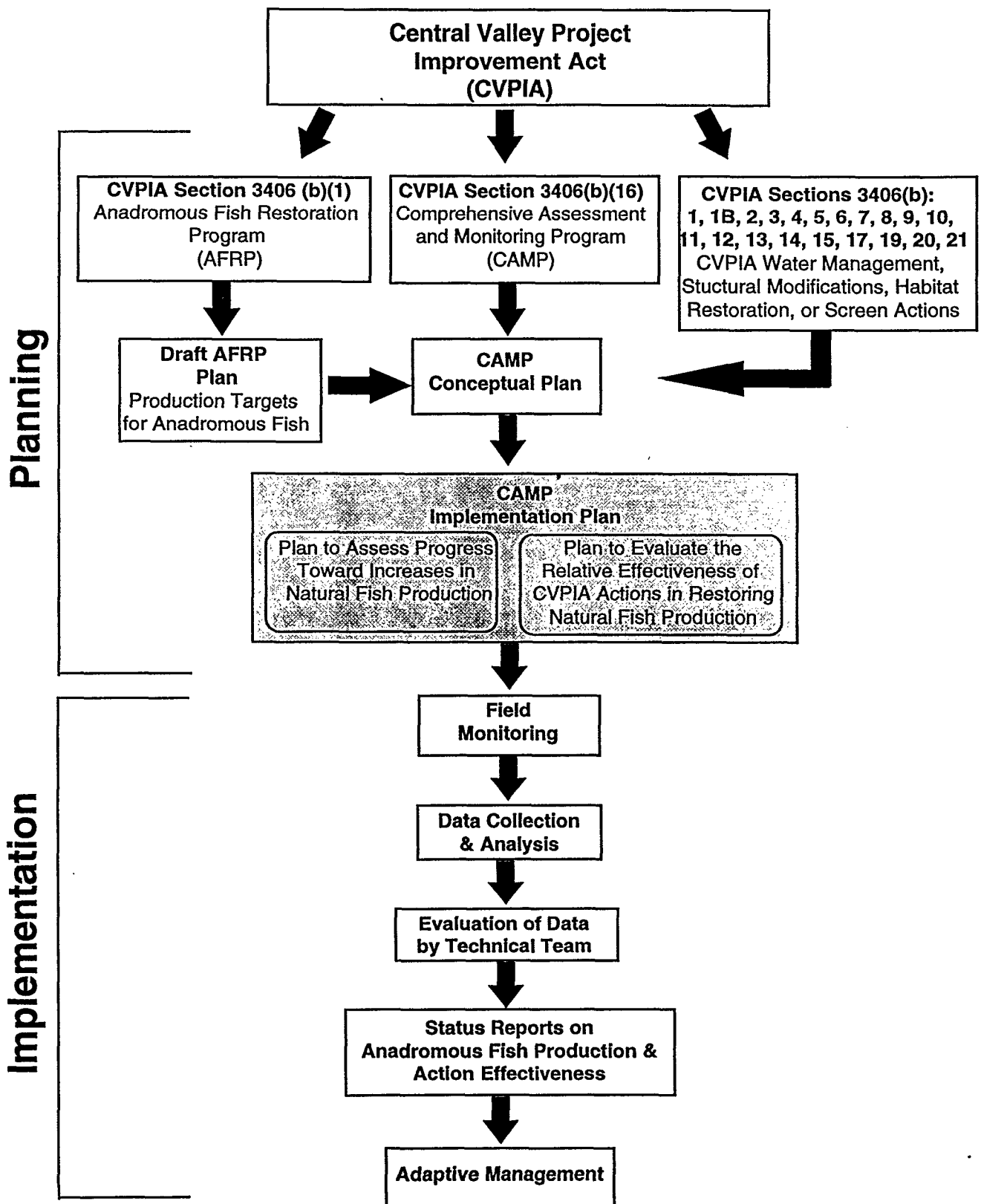
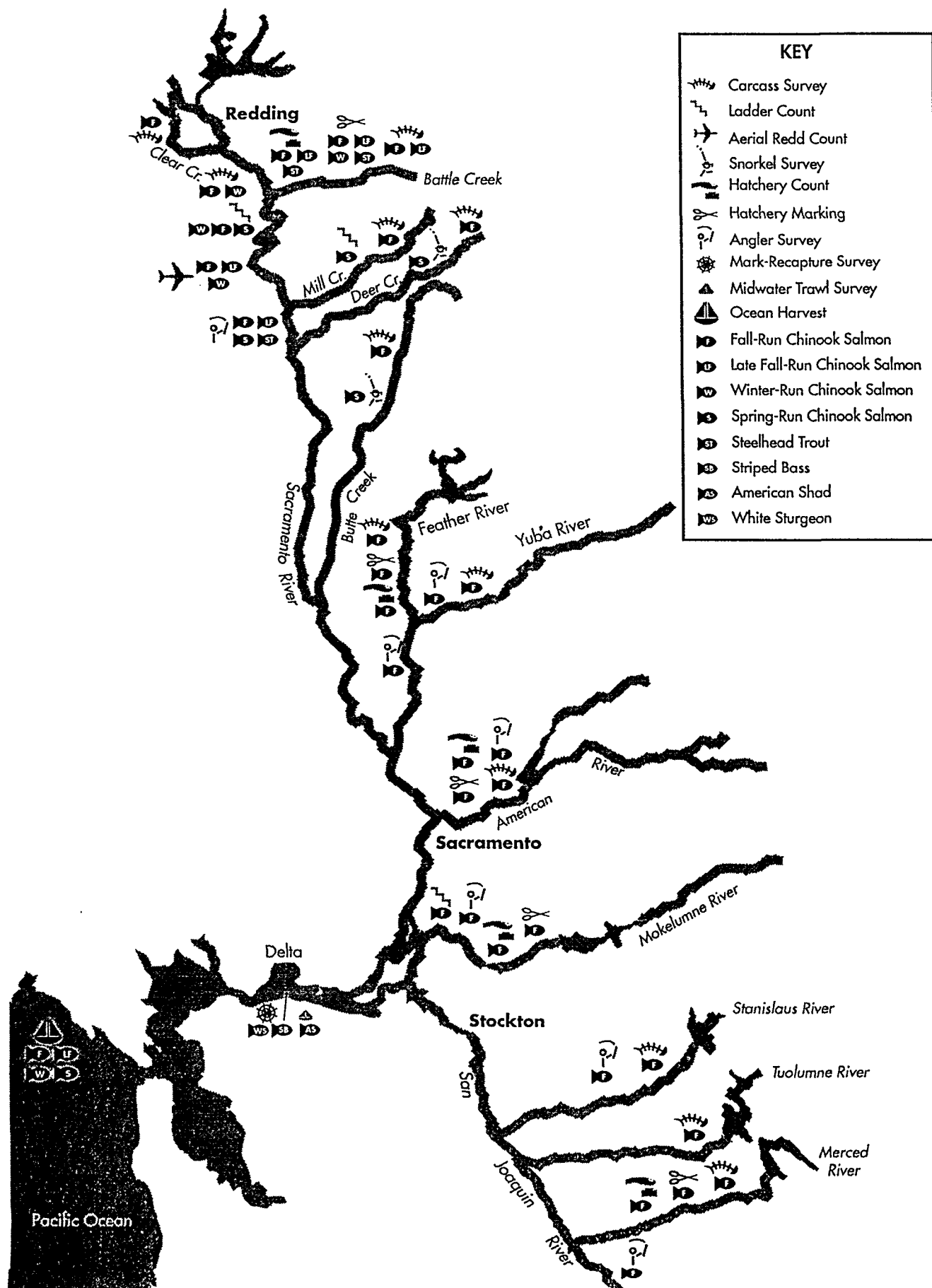


FIGURE 3.

Adult Monitoring Recommendations



D - 0 4 9 4 9 1

- they are sufficiently abundant, and
- they are distributed widely throughout the Central Valley.

CAMP recommended juvenile monitoring programs are shown in Figure 1.

Data Management System Recommendations

Data collected from the recommended monitoring programs will be stored in the Interagency Ecological Program database. Public access to the summary data will be through a CAMP home-page on the Internet.

Camp Budget and Funding Requirements

Budget estimates and one and five year projected funding requirements for CAMP's adult and juvenile monitoring programs, data management system, and staffing needs are summarized in Table 1.

Table 1. CAMP Budget and Funding Requirements

Project	Projected Cost		
	Total Budget (First Year)	Funding Reqs. ¹ (First Year)	Funding Reqs. ¹ (First 5 Years)
Field Monitoring	\$4,685,323	\$2,343,272	\$9,167,961
Data Management	\$ 129,272	\$129,272	\$621,365
Total	\$4,814,595	\$2,472,544	\$9,789,326

¹Funding requirements = CAMP Budget - Existing Funded Programs



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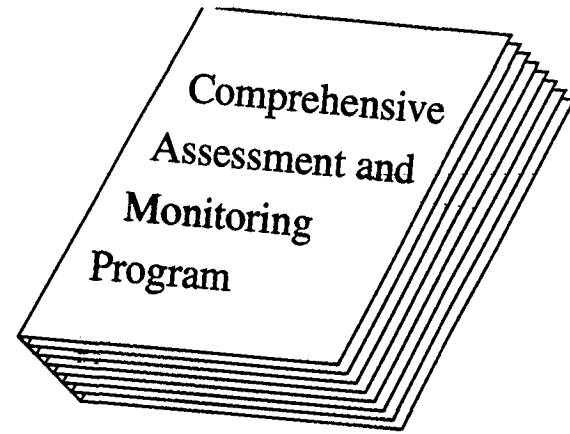
Serving the World's Environmental Needs

CVPIA Comprehensive Assessment and Monitoring Program (CAMP)

Comprehensive Assessment and Monitoring Program



What is CAMP?



- Comprehensive Assessment and Monitoring Program
 - A comprehensive program to assess fish and wildlife restoration actions and programs of the Central Valley Project Improvement Act (CVPIA) [Section 3406(b)(16)]

CAMP's Relationship to CVPIA

CVPIA Sections

Section 3401 Short Title
Section 3402 Purposes
Section 3403 Definitions
Section 3404 Contracting
Section 3405 Water Transfers

Section 3406 Fish, Wildlife and Habitat Restoration

Section 3407 Restoration Fund
Section 3408 Additional Authorities
Section 3409 Environmental Review
Section 3410 Authorization of
Appropriations
Section 3411 Compliance with State
Water Law
Section 3412 Extension of Tehama
Colusa Service Area

Section 3406

(a) Amendments to CVP Authorization

(b) Fish and Wildlife Restoration Activities

(c) San Joaquin and San Luis Rivers
(d) Central Valley
(e) Support
(f) Project
(g) Ecosystem
(h) Cost

Section 3406(b)

(1) Anadromous Fish Restoration
(2) 800,000 acre feet of water
(3) Water Acquisition

(16) CAMP

(2) Fish Screen
(3) 3406(b)(22) Water
(4) 3406(b)(23) Treaty
included in CAMP

CMARP's Relationship to CALFED

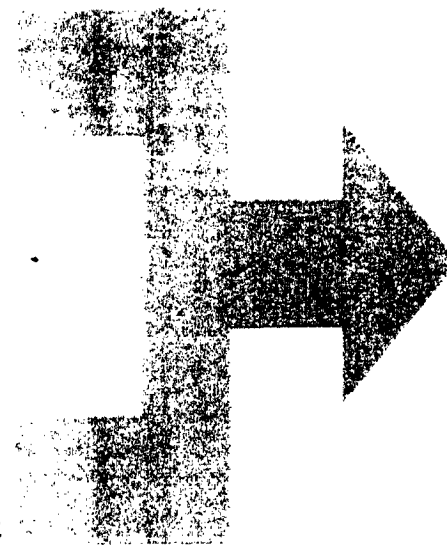
Ecosystem Restoration

Water Use Efficiency

Levee Stability

Water Quality

Storage and Conveyance



CMARP

Shared Objectives:

- clearly defined goals
- focused data collection
- standardized methods
- overall effectiveness of actions
- stakeholder participation
- basis for adaptive management
- defensible program

Differences:

CAMP

- focus on anadromous fish restoration
- no research
- categories of actions

CMARP

- broad scope
- includes research
- action specific

Implementation Plan Review

Stakeholders

- Bay Institute
- U.C. Berkeley
- CVPWA (Serge Birk & Jason Peltier)
- Contra Costa Water District
- Modesto Irrigation District
- Turlock Irrigation District
- Tehama Colusa Canal Authority
- East Bay Municipal Utility District
- MWD (Randy Bailey & Steve Hirsch)
- Sacramento River Preservation Trust
- John Williams - Consultant



■ Goal 1

Assess overall (cumulative) effectiveness of actions taken under “Fish and Wildlife Restoration Activities” [CVPIA Section 3406(b)]

■ Goal 2

Assess relative effectiveness of major categories of actions to meet “Fish and Wildlife Restoration Activities” goals [CVPIA Section 3406(b)]

- Water management modifications
- Structural modifications
- Habitat restoration
- Fish screens

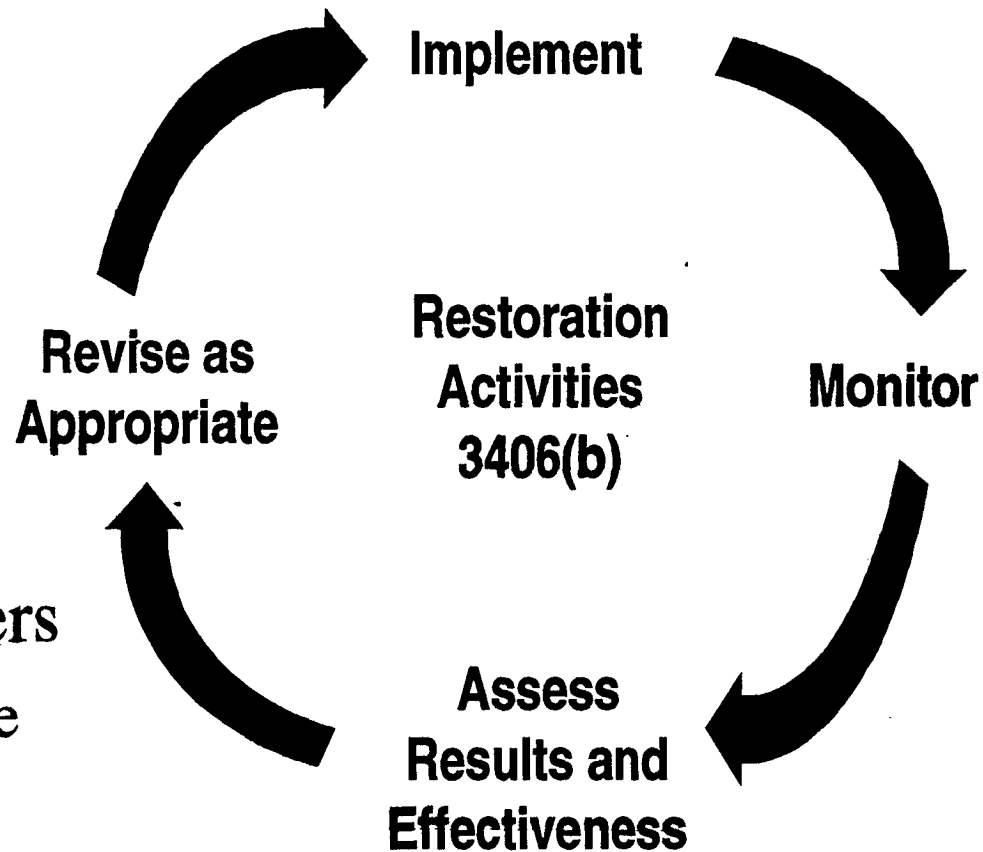


Benefits

- Verifies success of the CVPIA fish restoration provisions
- Measures progress toward anadromous fish restoration goals
- Identifies most effective actions under 3406(b) that restore fish production in Central Valley
- Results in better use of resources
- Improves implementation of actions and programs for restoring fish and wildlife
- Identifies future research needs

CAMP Assessment Process

- **Technical Committee**
 - Composed of technical experts
 - Helps interpret data
 - Recommends program adjustments
- **Project/Program Managers**
 - Take action as appropriate



**Adaptive Management
Cycle**



Achieving Goal 1

Goal

- Assess overall (cumulative) effectiveness of actions taken under “Fish and Wildlife Restoration Activities” [CVPIA Section 3406(b)]

Method

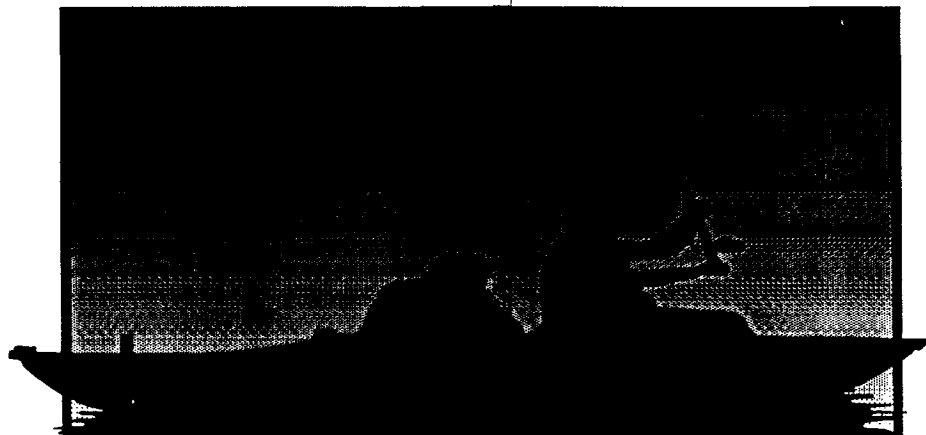
- Monitor population estimates of the life stage on which doubling production goals were based:

—Species:

- Chinook Salmon (all runs): monitor adults
- Steelhead Trout: monitor adults
- Striped Bass: monitor adults
- White Sturgeon: monitor adults
- Green Sturgeon: estimate from white sturgeon
- American Shad: juvenile abundance index

Adult Recommendations

Species	Monitoring Method
American Shad	Midwater trawl survey
Striped Bass	Mark-recapture
White Sturgeon	Mark-recapture
Green Sturgeon	Index of white sturgeon
Steelhead Trout	Angler survey, hatchery counts, hatchery marking
Chinook Salmon	Multiple methods





Achieving Goal 2

Goal

- Assess relative effectiveness of major categories of actions to meet “Fish and Wildlife Restoration Activities” goals [CVPIA Section 3406(b)]
 - Water management modifications
 - Structural modifications
 - Habitat restoration
 - Fish screens

Method

- Monitor juvenile fish production for
 - Fall, winter, and spring-run chinook salmon

Selection of Outmigrating Juvenile Chinook Salmon

- Only Exposed To Action Categories Occurring in Their Natal Streams
- Widely Distributed Throughout Central Valley
- Sufficiently Abundant
- Existing Monitoring Programs for Juveniles and Adults

Recommended Juvenile Monitoring Method: Screw Traps

Rationale

- Currently in use
- Relatively broad application
- Cost-effective
- Targets juvenile outmigrants

Recommended Use

- Place screw trap near river mouth
- Standardize screw trap operation and sampling
- Conduct screw trap efficiency tests

Data Management

- **Data Compilation and Entry**
- **Data Coordination**
- **Data Accessibility**

Data Compilation and Entry

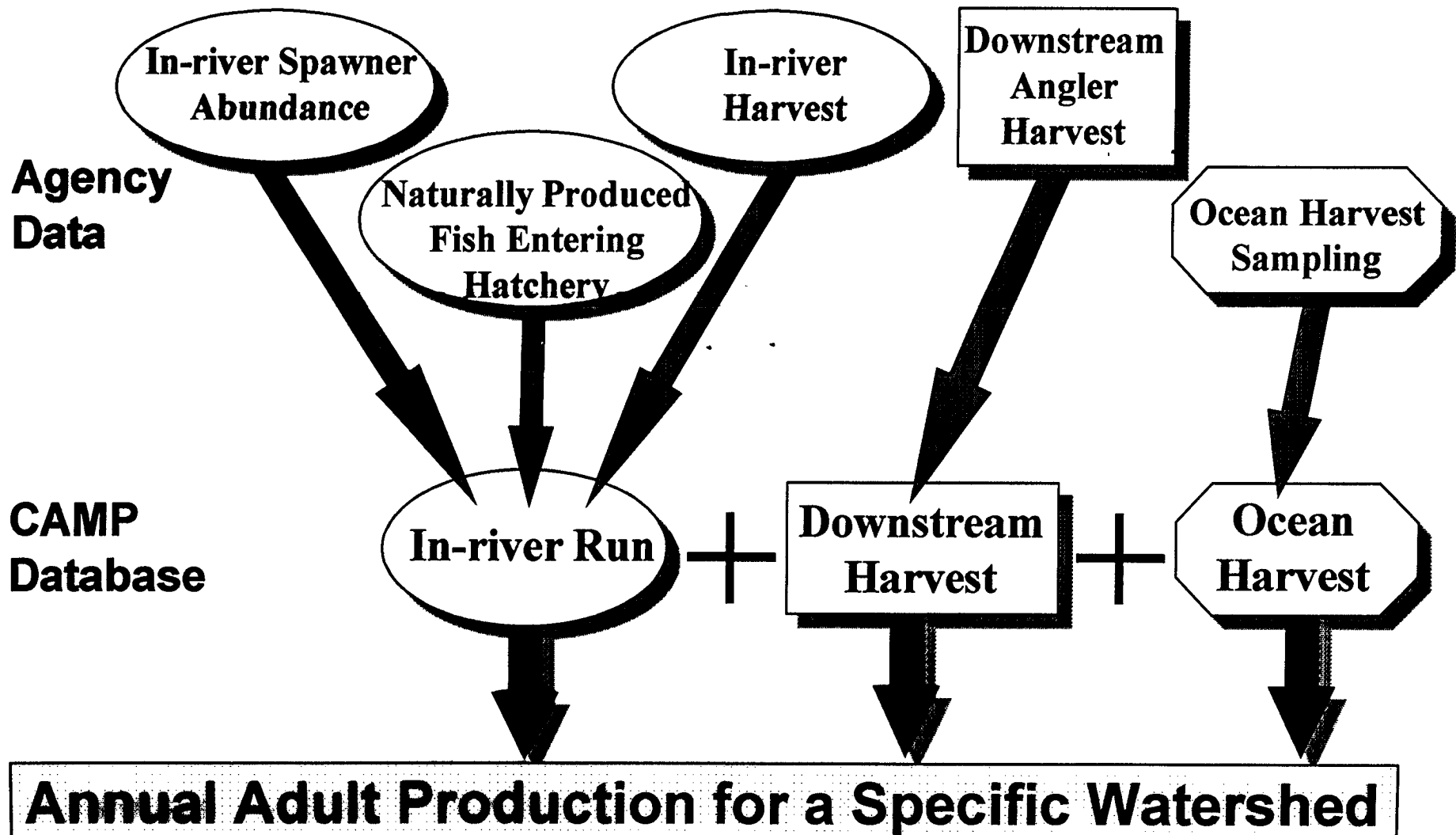
Adult Monitoring Data

- Annual summary data
- Annual adult production estimates
 - Watershed-specific
 - System-wide

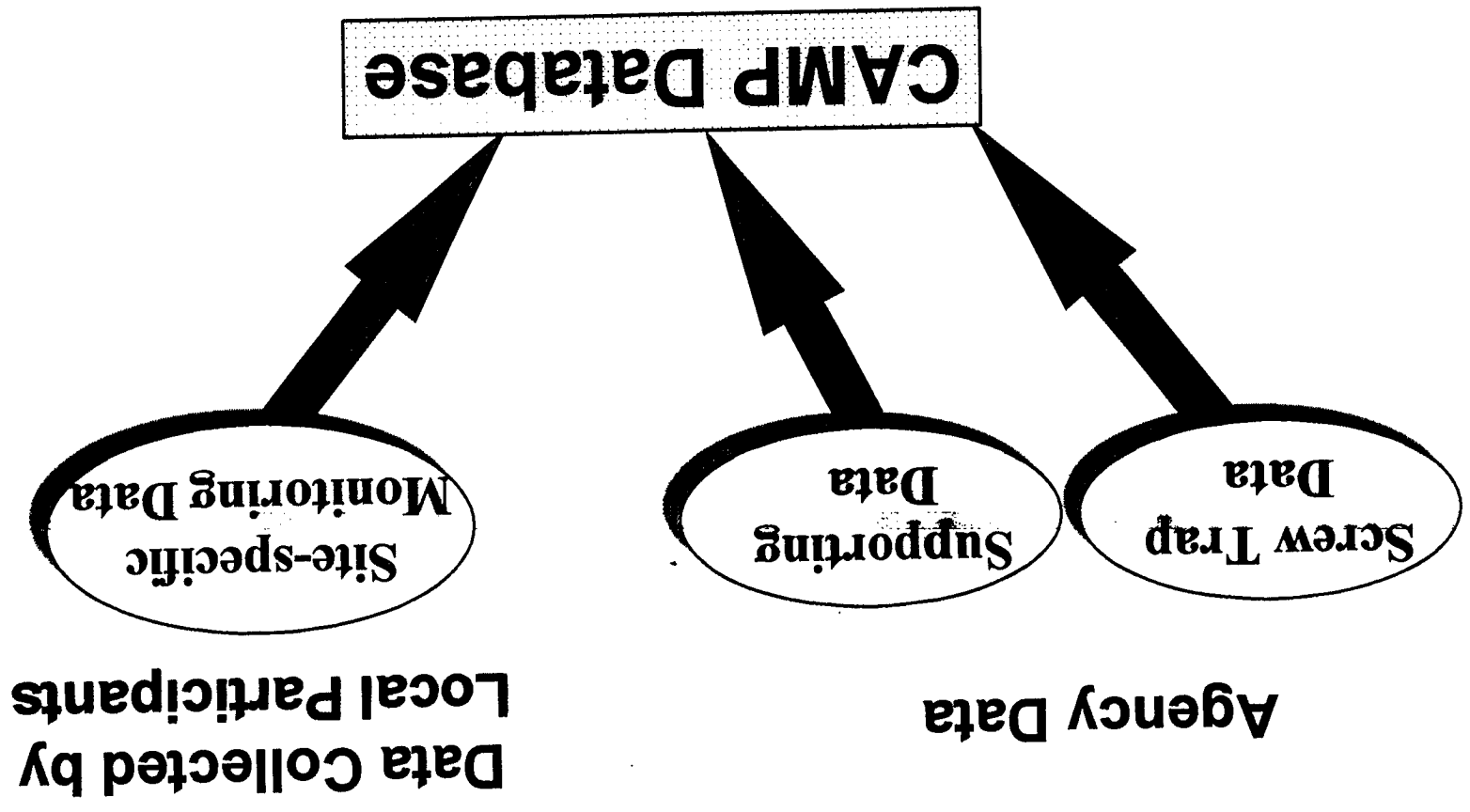
Juveniles

- Raw data
- Annual juvenile abundance estimate
 - Watershed-specific
- Supporting Data
 - Flow
 - Temperature
 - Other

Adult Data Coordination

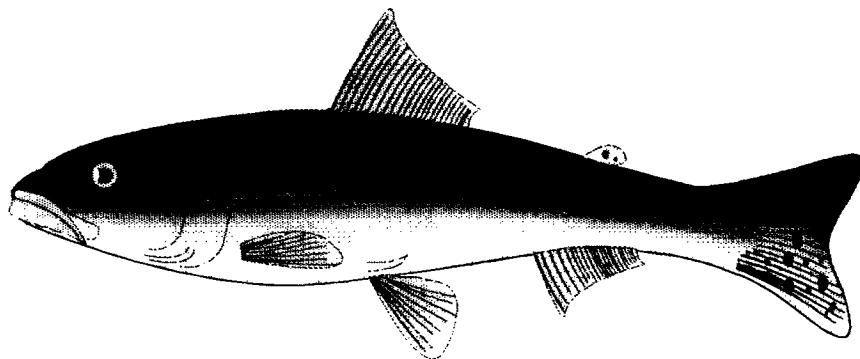


Juvenile Data Coordination



Data Accessibility

- **Internet - CAMP Homepage**
 - Interagency Ecological Program
- **Adult Production Data**
- **Juvenile Abundance Data**



Adult Data

**Data Accessibility
through the
CAMP
Homepage**

**Select
Watershed**

- American River
- Battle Creek
- Butte Creek
- Deer Creek
- Mill Creek
- Mokelumne River
- Sacramento River
- Stanislaus River
- Yuba River
- Systemwide

**Select
Species/Race**

- Fall-Run Chinook Salmon
- Late Fall-Run Chinook Salmon
- Winter-Run Chinook Salmon
- Spring-Run Chinook Salmon
- Steelhead Trout
- Striped Bass
- American Shad
- Green Sturgeon
- White Sturgeon

Year

**Trend for
All Years**

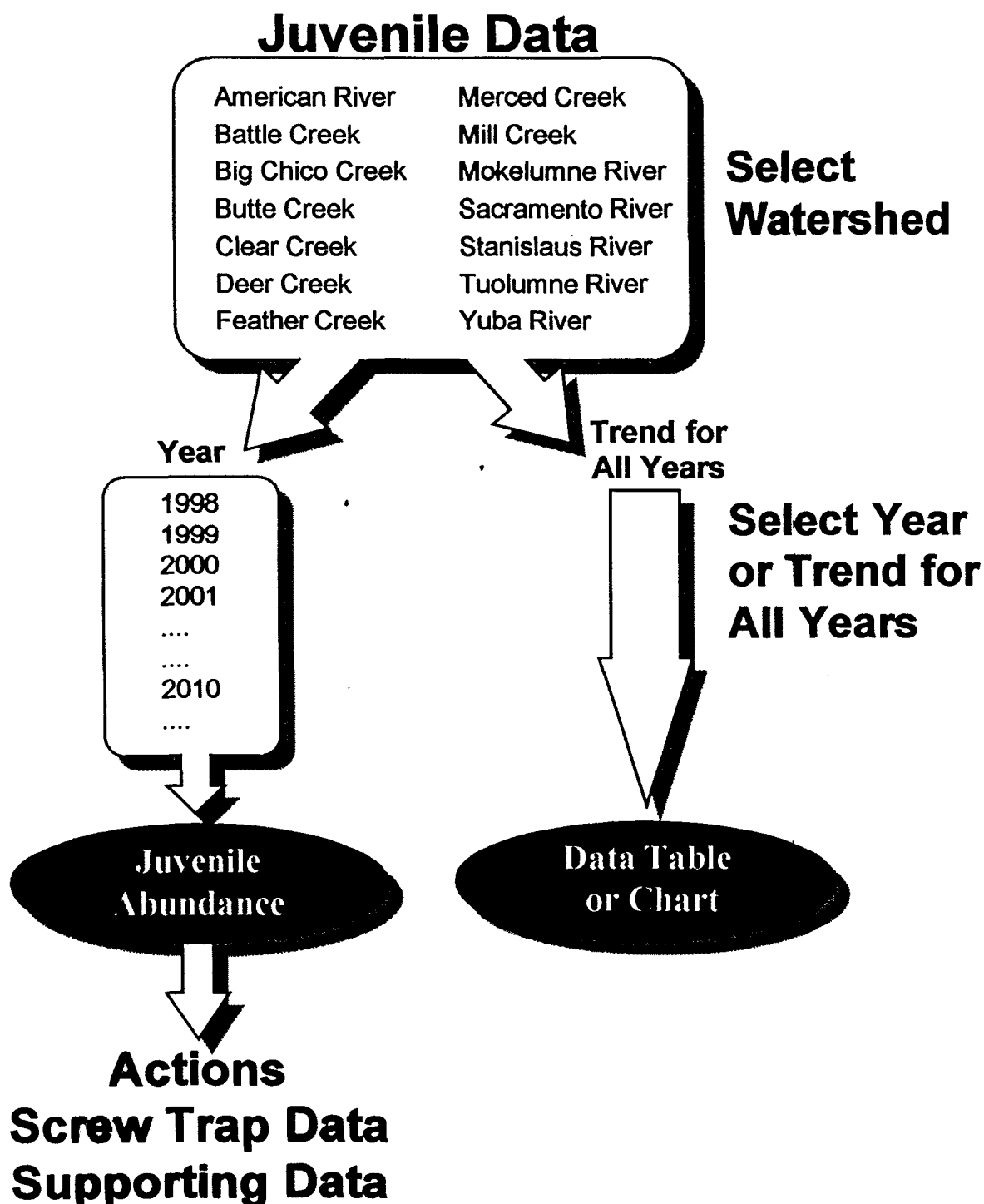
**Select Year
or Trend for
All Years**

- 1998
- 1999
- 2000
- 2001
-
-
- 2010
-

**Data Values and
Production Estimates**

**Data Table
or Chart**

Data Accessibility through the CAMP Homepage



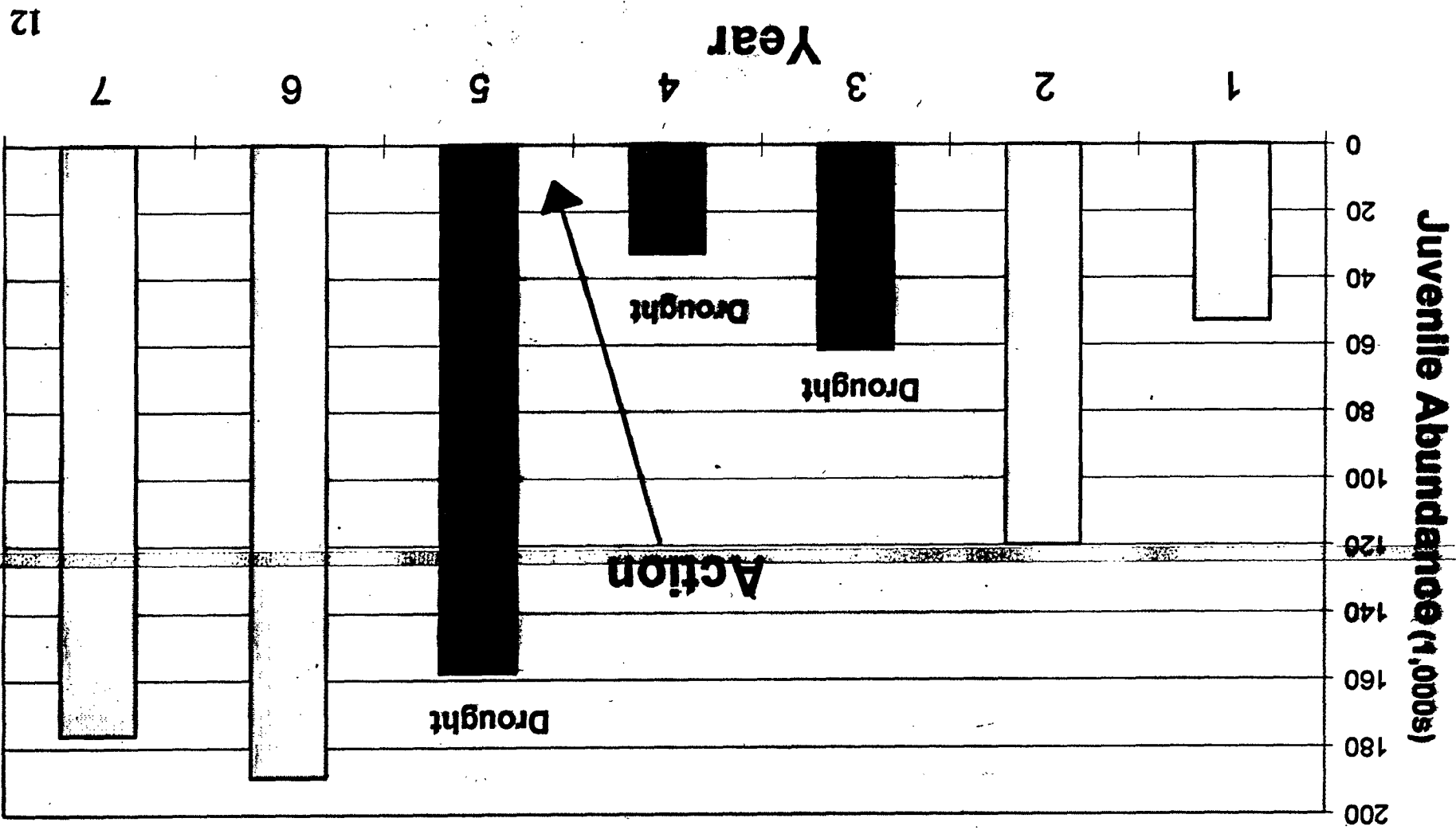
Example of "Weight of Evidence" Evaluation

Effects of actions on juvenile abundance						Watershed	Action
Adult spawner/ juvenile ratio	A/RP results	Qualitative Analysis	Before/After	Trend Analysis			
	% of total abundance						
		Positive	Significant (P<0.05)	Significant (P<0.05)		Upper Sacramento	Flow Enhancement
		Neutral	NS	NS			Spawning gravel additions
		Slight Positive	NS	NS		Stanislaus	Pulse Flows
							320/66,000
							18
							2
							(once per stream)
							750/150,000
							50

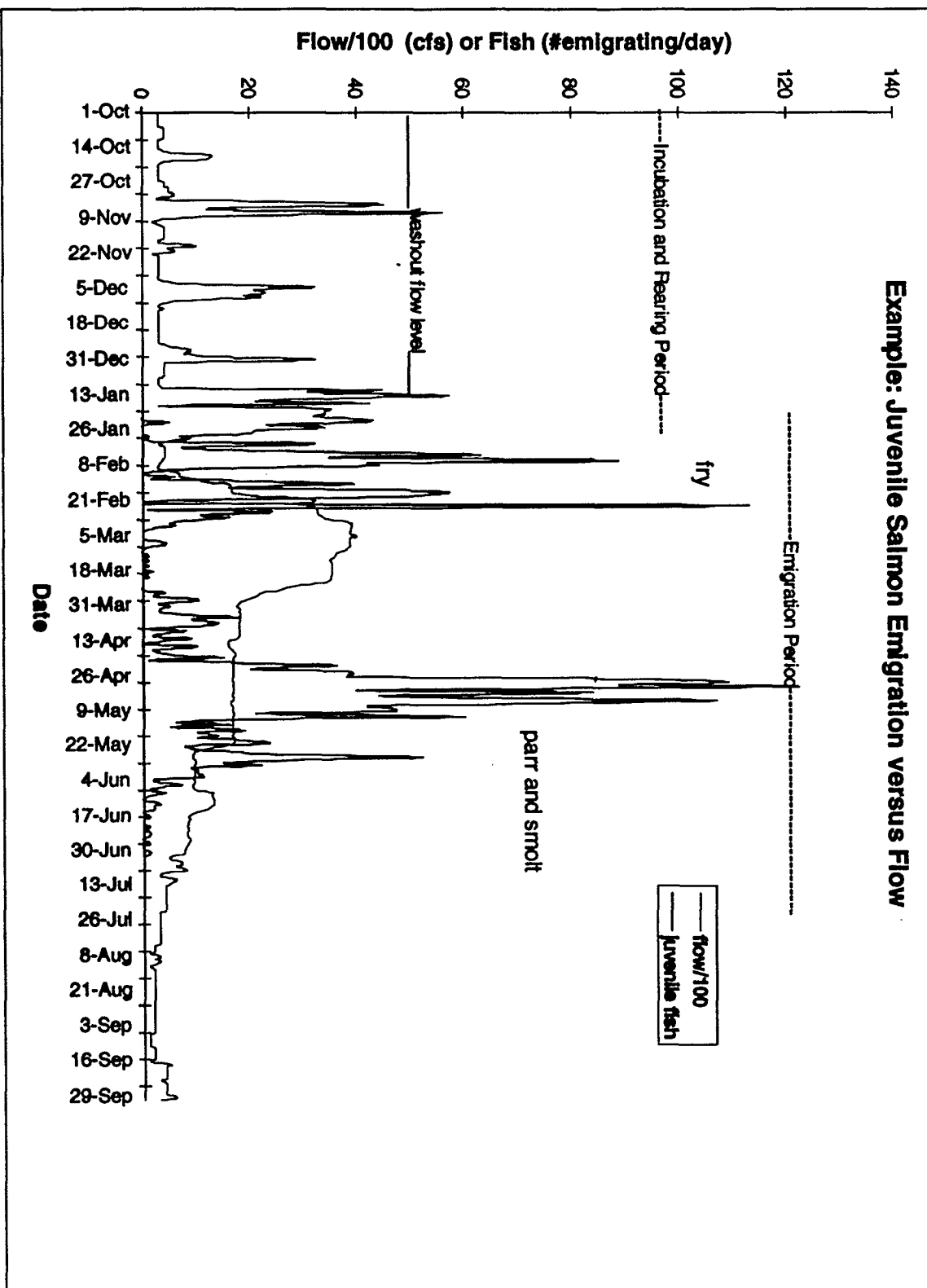
Example of Action Effectiveness

CAMP Implementation Plan

Evaluation



Example: Juvenile Salmon Emigration versus Flow





Central Valley Project Improvement Act (CVPIA)

CVPIA Section 3406(b)(1)
Anadromous Fish Restoration
Program (AFRP)

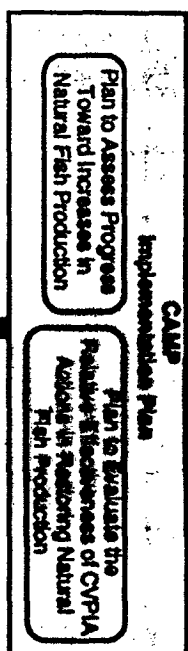
Draft AFRP Plan
Production Targets for
Anadromous Fish

CVPIA Section 3406(b)(16)
Comprehensive Assessment
and Monitoring Program
(CAMP)

CAMP
Conceptual Plan

CVPIA Section 3406(b):
1, 1B, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 17, 19, 20, 21
CVPIA Water Management,
Structural Modifications, Habitat
Restoration, or Screen Actions

Planning



Field
Monitoring

Data Collection
& Analysis

Evaluation of Data
by Technical Team

Status Reports on Anadromous Fish
Production & Action Effectiveness

Adaptive Management

Implementation